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Intestinal Parasitosis Among Food Handlers in a Tertiary Hospital in North Central Nigeria

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ABSTRACT

BACKGROUND: Food borne diseases (FBD), such as intestinal parasitosis, remain a major public health issue across the globe, especially in developing countries. The entire hospital community is at risk of acquiring these diseases from food handlers (FHs) in hospitals. Hospitalized patients are particularly at risk primarily due to compromised immunity. OBJECTIVES: This study determined the carriage rate of intestinal parasites and assessed the socio-demographic factors associated with carriage among FHs in a tertiary hospital in Nigeria.
METHODS: A cross-sectional study that involved screening of all FHs in the hospital for intestinal parasites was conducted from May 2018 to June 2018. Finger swabs and fresh stool specimens of the FHs were collected and examined for intestinal parasites following standard microbiological techniques. The socio-demographic characteristics of the FHs were also obtained using structured questionnaires specifically designed for the study.
RESULTS: Of the 81 FHs studied, 9 (11.1%) were positive for different types of intestinal parasites. ***Entamoeba histolytica*** (33.3%) and hookworms (33.3%) were the most common intestinal parasites, followed by ***Taenia spp***. (22.2%) and ***Ascaris lumbricoides*** (11.2%). All intestinal parasites were detected in stool specimens with none recovered from the finger swabs. The educational level of the FHs was significantly associated with intestinal parasitosis (p=0.047).
CONCLUSION: FHs in this study are carriers of intestinal parasites and their level of education is significantly associated with intestinal parasitosis. Periodic screening and eradication therapy for infested FHs are recommended to avoid outbreaks of FBD in hospitals.

Keywords (MeSH): Food Borne Diseases, Food Handlers, Intestinal Parasitosis, Nigeria

INTRODUCTION

Food borne diseases (FBD) are important causes of morbidity and mortality worldwide [1]. They are diseases that result from ingestion of food and/or water contaminated by chemicals, pathogenic organisms (such as bacteria, viruses, parasites and fungi) and/or their toxins [2]. Diarrheal diseases, primarily caused by food borne or waterborne pathogens, are leading causes of illness and deaths, accounting for an estimated 1.9 million deaths annually at the global level [3]. These diseases have a substantially higher impact in low-income countries and regions with poor water quality, poor sanitation and food safety [4]. Food and water are excellent sources through which food borne pathogens (FBPs) are transmitted to humans. Food contamination may occur at any point along the process of production; farm, preparation & processing, and distribution. FHs with poor personal hygiene working in food-service establishments are potential carriers of FBPs that cause FBD.

FBPs including intestinal parasites can be transferred by direct contact via the hands and/or airborne droplets from coughing/sneezing onto food, thus, FHs need to be educated on the importance of effective hand hygiene and other barriers to pathogen contamination of food. Intestinal parasites remain very common as agents of FBD,

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especially in the developing countries [4]. These parasites are often transmitted through food and water contaminated with feces, as well as through direct contact (i.e. feces contaminated hands). This mode of transmission is referred to as feco-oral transmission. Some groups of individuals are at greater risk for getting FBD. These groups of people can be found in the hospital setting and include pregnant women, infants, the elderly and the immune-compromised persons such as persons with Human immunodeficiency virus (HIV) infection or those undergoing treatment for cancer [5].

FHs, who work in the hospital environs, are also potential carriers of intestinal parasites. The roles of such FHs in food borne infections within hospitals have not been well elucidated. This study, therefore, determined the prevalence of intestinal parasites among FHs at the University of Ilorin Teaching Hospital (UITH) in Ilorin and assessed socio-demographic factors associated with intestinal parasitosis.

METHODS

Study design and area: This was a cross-sectional study that was carried out at the UITH, Ilorin. It is a hospital with 650 beds and an average of 10,000 and 12,000 annual admissions and out-patient visits, respectively. Ilorin is the capital city of Kwara State, which is located in the North Central region of Nigeria.

Participants/Subjects:

Inclusion criteria: A food handler was defined as a person in the food trade or someone professionally associated with it, such as a food inspector who, in his or her routine work, comes into direct contact with food in the course of its production, processing, packaging or distribution. All consenting professional FHs, irrespective of age and gender, were recruited for the study.

Exclusion criteria: FHs who had used anti-helminthic drugs within one week prior to time of recruitment or were still on such drugs.

Study protocol: The study population consisted of 84 FHs and these included the staff of the hospital kitchens (main and special diet kitchens), self-employed FHs at the doctors' lounge, nurses' lounge and the various canteens situated within the hospital premises. A structured questionnaire specifically designed for the study was used to obtain data on socio-demographics, years of service and the use of anti-helminthic drugs in the preceding one week from the FHs. Three FHs were excluded from the study on account of having recently used anti-helminthic agents.

Sampling technique: Total population sampling and the FHs were recruited consecutively in a non-repetitive manner.

Specimen collection: Finger swabs and fresh stool samples were collected from the FHs over a period of two months spanning between May 2018 and June 2018. The swabs were taken by the researchers, from the inter-digital clefts of the hands and fingernails of each study participant using a sterile and normal saline-moistened cotton-tipped swab stick. Each swab stick was immediately placed into a labeled sterile Bijou bottle containing peptone water before transportation to the laboratory for processing.

Each participant was then given a clean, dry, leak-proof, wide mouthed and well labeled specimen bottle for stool collection. Where the participants could not immediately produce the stool samples, the specimen bottles were left with such participants who were instructed to call any of the researchers on phone as soon as they were about to provide the stool specimen while on duty. The samples were transported to the medical microbiology and parasitology laboratory of the hospital within one hour of collection for prompt processing.

Laboratory work: In the laboratory, the stool samples were first visually inspected for the presence of blood and/or mucous and worms. The blood or mucous stained portions of the stool, where present, were used for wet stool preparations. Wet stool preparations were made in saline and eosin which were transferred onto slides and microscopically examined under 10X and 40X objectives, having applied cover slips on a pre-warmed compound light microscope stage, specifically for trophozoites of intestinal parasites. The stool samples were concentrated by formol ether concentration technique and used to identify cysts of intestinal parasites [6].

Statistical analysis: Statistical data analysis was performed using Statistical Package for Social Sciences (SPSS) version 20. Continuous variables were presented using mean, standard deviation and range. Categorical variables were presented in proportions and percentages. Categorical variables were compared using Chi-square test. A p value < 0.05 was considered to be statistically significant at 95% confidence level.

Ethical consideration

Consent process: Informed written consent was obtained from the FHs after introducing and explaining the purpose of the study to them. Their confidentiality was maintained by using codes instead of names and keeping the data away from non-members of the research team.

Institutional review board (IRB): Ethical approval was obtained from the Ethical Review Committee (ERC) of UITH, Ilorin before the commencement of the study. UITH ERC Approval Number: ERC PAN/2018/03/1770

RESULTS

The ages of the 81 food handlers, who met the inclusion criteria ranged from 13 to 70 years (mean age ± SD = 37 ± 15 years). Majority of the food handlers (69/81) were females (85.2%). The other socio-demographic characteristics of the study population are as shown in Table 1.

The prevalence rate of intestinal parasites among the FHs was 11.1% (9/81). As illustrated in Table 3, of the 9 parasites isolated from feces, ***E. histolytica*** accounted for 3 (33.3%), hookworms 3

Table 1: Food handlers' Socio-demographic Characteristics

Variable	Frequency (N=81)	Percentage (%)
Age		
Mean ± S.D	36.96 ± 14.580	
Range	13 - 70	
Age group		
≤20	15	18.5
21 – 30	17	21.0
31 – 40	15	18.5
41 – 50	18	22.2
≥51	16	19.8
Gender		
Male	12	14.8
Female	69	85.2
Tribe		
Yoruba	72	88.9
Hausa	4	4.9
Igbo	2	2.5
Others	3	3.7
Other tribes (n=3)		
Ogori	1	33.3
Togolese	2	66.7
Religion		
Islam	39	48.1
Christianity	42	51.9
Marital status		
Single	16	19.8
Married	65	80.2
Education		
None	15	18.5
Primary	17	21.0
Secondary	28	34.6
Tertiary	21	25.9
Years of working experience		
<1 year	12	14.8
1 – 5 years	22	27.2
6 – 10 years	26	32.1
11 – 15 years	2	2.5
>15 years	19	23.5

(33.3%), ***Taenia spp.*** 2 (22.2%) and ***A. lumbricoides*** 1 (11.2%). No parasite was isolated from the feces of FHs aged 30 years and below. No parasite was recovered from any of the finger swab specimens taken from the FHs. Socio-demographic factors associated with intestinal parasitosis: Low educational status of the food handlers was the only socio-demographic characteristic that was significantly associated with increased intestinal parasitosis (p=0.047) as depicted in Table 2.

Table 2: Socio-demographic factors associated with the presence of intestinal parasites in the stool of the food handlers

Variable	Intestinal parasite present in stool			χ^2	p Value
	Yes(n=9)	No(n=72)	Total(n=81)		
Age group					
≤20	0 (0.0)	14 (19.4)	14 (17.3)		
21 – 30	0 (0.0)	17 (23.6)	17 (21.0)		
31 – 40	3 (33.3)	12 (16.7)	15 (18.5)	6.373	0.173
41 – 50	3 (33.3)	15 (20.8)	18 (22.2)		
≥ 51	3 (33.3)	14 (19.4)	17 (21.0)		
Gender					
Male	0 (0.0)	12 (16.7)	12 (14.8)	1.761	0.185
Female	9 (100.0)	60 (83.3)	69 (85.2)		
Tribe					
Yoruba	7 (77.8)	65 (90.3)	72 (88.9)		
Hausa	1 (11.1)	3 (4.2)	4 (4.9)	4.359	0.225
Igbo	1 (11.1)	1 (1.4)	2 (2.5)		
Other	0 (0.0)	3 (4.2)	3 (3.7)		
Religion					
Islam	2 (22.2)	37 (51.4)	39 (48.1)	2.726	0.099
Christanity	7 (77.8)	35 (48.6)	42 (51.9)		
Marital status					
Single	1 (11.1)	15 (20.8)	16 (19.8)	0.477	0.490
Married	8 (88.9)	57 (79.2)	65 (80.2)		
Education					
None	4 (44.4)	11 (15.3)	15 (18.5)		
Primary	3 (33.3)	14 (19.4)	17 (21.0)	7.964	0.047*
Secondary	0 (0.0)	28 (38.9)	28 (34.6)		
Tertiary	2 (22.2)	19 (26.4)	21 (25.9)		
Working experience					
<1 year	1 (11.1)	11 (15.3)	12 (14.8)		
1 – 5 years	3 (33.3)	19 (26.4)	22 (27.2)	1.624	0.804
6 – 10 years	4 (44.4)	22 (30.6)	26 (32.1)		
11 – 15 years	0 (0.0)	2 (2.8)	2 (2.5)		
>15 years	1 (11.1)	18 (25.0)	19 (23.5)		

*χ2: Chi square test, *: p value < 0.05 (statistically significant)*

DISCUSSION

In our study, the mean age of the FHs was approximately 37 years, majority of them were females and only 15 (18.5%) amongst them had no level of education. Intestinal parasites were identified in the stools of 9 out of 81 FHs studied and the affected FHs were all females. Of the socio-demographic factors analyzed, the level of education was the only factor significantly associated with fecal carriage of intestinal parasites among the FHs (p=0.047). ***Entameoba histolytica (E. histolytica)*** and hookworms were the

Table 3: Spectrum of intestinal parasites among the food handlers

Age groups (in years)	Ascaris lumbricoides (n=1)	Entamoeba histolytica (n=3)	Hookworm (n=3)	Taenia spp (n=2)	No Parasite seen (n=72)	Total (n=81)
≤ 20	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	14 (17.3)	14 (17.3)
21-30	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	17 (21.0)	17 (21.0)
31-40	0 (0.0)	1 (1.2)	0 (0.0)	2 (2.5)	12 (14.8)	15 (18.5)
41-50	1 (1.2)	1 (1.2)	1 (1.2)	0 (0.0)	15 (18.5)	18 (22.2)
≥ 51	0 (0.0)	1 (1.2)	2 (2.5)	0 (0.0)	14 (17.3)	17 (21.0)
Total	1 (1.2)	3 (3.7)	3 (3.7)	2 (2.5)	72 (88.9)	81(100.0)

most prevalent parasites among the FHs. The age range of the FHs in this study was 13-70 years and it is comparable to that of the kitchen staff of a tertiary care hospital in a similar study conducted in Saudi Arabia [7]. However, it contrasts with the age range of the food service staff in another study in a hospital in Qatar where none of the FHs was less than 20 years of age [8]. The inclusion of FHs who are not staff of the hospital in our study may account for this observed difference.

With regards to gender distribution in our study population, there were more females than males with a male to female ratio of approximately 1:6. Conversely, in the study from Qatar there were more male FHs than their female counterparts with a male to female ratio of 8:1 [8]. Most studies have, however, reported a higher proportion of females involved in food handling [9, 10]. Analyzing their level of education, 49 (60.5%) of the 81 FHs in this study had secondary level of education; this contrasts with a study carried out in Saudi Arabia where 17 (8.5%) of the 200 FHs had secondary education. Majority of the FHs in the latter study [7], either had no formal education 64/200 (32.0%) or primary level education alone 119/200 (59.5%). In a study from Qatar, more than 80.0% of the 43 FHs studied had a minimum of secondary level education [8]. This percentage is higher than the 60.5% in this study, but may be due to the lower sample size in the Qatar study.

The prevalence rate of intestinal parasites among the FHs in this study was 11.1%. This is higher than the range of 1.3%-7.0% reported in a similar study in India [11], but lower than the prevalence rate of 23.0% obtained in another study conducted in a tertiary hospital in Saudi Arabia [7]. In Enugu, Nigeria where 306 FHs around the premises of a hospital were studied, a higher prevalence rate of 41.2% was obtained [12]. In Brazil, where a two phase study of the prevalence of intestinal parasites was carried out among FHs in two private and three public hospitals, higher prevalence rates of 14.2% (17/120) and 17.1% (12/70) were obtained [13]. The differences in sample sizes, study duration and period and geographical locations in which these studies were carried out may account for the differences in the observed rates of intestinal parasitic infection. The observed rate of parasitic infection in this study is also lower than the rates of 38.1% and 55.6% obtained among non-health sector FHs in Abuja and Jos, Nigeria respectively [4,14]. It is, however, higher than the rate of 10.4% reported among FHs in the non-health sector in Iran [15], but lower than the rate of 45.3% observed among the FHs at the University students' cafeteria in Addis Ababa, Ethiopia [16].

Generally, the carriage rates of intestinal parasitic infection among FHs working in the health sector appear to be lower than the carriage rates among FHs in the non-health sector. This may reflect better knowledge of food practices and environmental hygiene, stricter food regulations and better compliance with regular medical screening for agents of FBD among FHs in the health sector.
In Nigeria, ***E. histolytica***, followed by ***Ascaris lumbricoides (A. lumbricoides)*** was the parasite with the highest prevalence rate among FHs in Jos [14], Enugu [12] and Abeokuta [17]. In Abuja the capital of Nigeria, however, ***A. lumbricoides*** was the parasite with the highest prevalence rate followed by ***E. histolytica*** [4]. These results are similar to the findings in this study, except ***A. lumbricoides*** is the least prevalent parasite, which may be due to the relatively smaller sample size. ***E. histolytica*** (33.3%) and hookworm (33.3%) were the most prevalent parasites in this study. ***Giardia lamblia (G. lamblia)*** was the most frequent parasite discovered among the hospital FHs in India and Saudi Arabia [7, 11].

In Ethiopia, ***E. histolytica/dispar*** followed by ***G. lamblia*** was the most prevalent parasite among the FHs at the students' cafeterias in Addis Ababa University [16], whereas ***G. lamblia*** was the most prevalent parasite followed by ***E. histolytica*** among the FHs at the food and drinks establishments in Aksum town, North Ethiopia [18]. In Brazil, ***Entamoeba coli*** was the most frequent intestinal parasite seen among FHs in two different studies [13, 19]. ***G. lamblia*** and ***E. histolytica/dispar*** and ***G. lamblia*** and ***Entamoeba coli*** were the most prevalent parasites among FHs in studies from Sudan and Iran, respectively [15,20]. Geographical differences in the prevailing parasites may be responsible for the differences in the enteroparasites with the highest prevalence rate in the various studies.

Of the various socio-demographic characteristics taken into consideration in this study, the level of education of the FHs was the only factor whose association with the presence of parasitic infection attained statistical significance (p=0.047). The occurrence of intestinal parasitic infection was significantly higher among FHs with lower educational status. This finding agrees with the results of a previous study which observed that the odds of being positive for intestinal parasitic infection was three times higher among FHs with no formal education compared to FHs who have at least secondary level of education [18].

In this study, all FHs with intestinal parasitic infection were females over 31 years of age. Some studies have reported higher prevalence of intestinal parasites among female FHs [12, 16]. However, our findings contrast with those of a study in Kenya [21] where the parasite occurrence was mainly noted in those within age bracket of

21-30 years with males having a higher rate of parasitic infection and the occurrence of parasitic infection was significantly different between the age groups (p = 0.032). The level of education of the FHs also had no significant association with the presence of intestinal parasites in their stool, (p = 0.976) unlike results found in our study (p= 0.047). The gender difference in parasitic infection rate in their study [21], similar to this study, was not significant (p = 0.772 and p = 0.185 respectively).

Limitations: Our use of more sensitive and less laborious diagnostic tools such as serology-based enzyme immunoassays and/or molecular-based assay such as polymerase chain reaction was limited by non-availability and high cost of these tests. Our small sample size is another limitation.

CONCLUSION

The observed rate of intestinal parasitic infection among the FHs in our study is epidemiologically significant and the level of education of the FHs was significantly associated with intestinal parasitosis. Therefore, it is important to educate the FHs on the importance of effective food safety practices and environmental hygiene.

Periodic screening of FHs for intestinal parasitic infections followed by treatment and eradication of infection when detected is recommended to prevent outbreaks of intestinal parasitosis in our hospitals and the larger community.

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